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Problem-Solving Appraisals as a Protective Mechanism in COVID-19-Related PTSD

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Abstract

Many individuals perceived the COVID-19 pandemic as a profound traumatic occurrence that triggered substantial increases in fear, anxiety, and PTSD symptoms. While negative cognitive appraisals have long been linked to the emergence and continuation of emotional difficulties, considerably fewer studies have explored how positive, adaptive appraisals may help safeguard mental well-being. This research aimed to bridge that gap by examining the influence of problem-solving appraisals on the connection between fear of COVID-19 and PTSD symptoms. The sample consisted of 322 university students who completed the Fear of COVID-19 Scale, the Problem-Solving Inventory, the PTSD Checklist for DSM-5, and the five-item short form of the State–Trait Anxiety Inventory. The participants' mean age was 26 years (± 10.2; range 17–63 years). Findings showed that problem-solving appraisal acted as a mediator between fear of COVID-19 and every dimension of PTSD. However, further analysis revealed that anxiety levels moderated this mediation. The indirect pathway from fear of COVID-19 to PTSD was statistically significant only among individuals reporting low anxiety. These results highlight the importance of interventions that identify and modify unhelpful views of one's problem-solving capabilities while also tackling anxiety symptoms that can obstruct effective coping.

Keywords: Fear of COVID-19, Problem-solving appraisal, PTSD, Anxiety, Students

Introduction

The COVID-19 pandemic constituted a worldwide public health crisis of unprecedented scale. In an effort to limit viral transmission, governments worldwide implemented multiple containment measures, including nationwide lockdowns, travel restrictions, compulsory social distancing, and mandatory remote work [1]. The present study took place in South Africa, a country that imposed some of the strictest restrictions, disrupting everyday routines and worsening existing socio-economic pressures. These measures had a particularly strong effect on the tertiary education sector and its students [2]. To maintain academic continuity, universities quickly shifted to fully online delivery modes. This involved implementing virtual lectures, electronic assignment uploads, and remote assessments. Although unavoidable, the transition generated fresh challenges for students, such as unequal access to technology, difficulties adjusting to remote study, and diminished face-to-face social contact, all of which could heighten feelings of loneliness and worry [3, 4].

Access to mental health support among students during this period varied widely [5-7]. Physical distancing measures reduced opportunities for in-person support from friends, family, and professionals for many, yet the pandemic simultaneously drove rapid development of digital mental health resources [8]. Across numerous nations, online counseling and therapy became far more common, with many practitioners offering virtual sessions for the first time [8, 9]. These innovations helped counteract the loss of traditional contact and expanded support options for some students. Still, the quality and

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reach of such services varied widely depending on users' digital skills, internet access, and personal comfort with remote care [5-7]. Additional strain arose from the outbreak's distinctive features — extremely high infection numbers, many severe cases, and multiple emerging variants — all of which intensified psychological strain [10]. In lower-resource settings, shortages of protective equipment, economic contraction, unequal digital access, widespread unemployment, and food insecurity concerns compounded the overall mental health impact of the pandemic [2, 11].

Fear emerged as a dominant emotional reaction to the crisis [12, 13]. Research in Jordan found a 52.7% prevalence of fear in the general population, largely driven by concerns about personal infection risks and potential harm to family members [14]. In Bangladesh, a separate study among working adults found an even higher rate of 86.3%, primarily connected to economic fallout and employment uncertainty [15]. In South Africa, teachers reported higher fear levels than those reported in comparable low- and middle-income nations [16]. A broad systematic review and meta-analysis focusing on students estimated a 33% prevalence of fear in this group [17]. Key contributors included struggles with sudden online learning, setbacks in academic progress, and extended social isolation.

Although fear can serve a useful purpose when confronting a serious and potentially dangerous threat, extremely high fear levels can harm mental health and contribute to elevated anxiety after disease outbreaks [18, 19]. Anxiety, especially when viewed as a stable personality trait, makes people more likely to see various situations as dangerous. This tendency intensifies the stress created by the many unknowns of the pandemic [20]. People with elevated trait anxiety tend to interpret events as threatening even when they are not, resulting in greater overall stress and persistent worry about the pandemic's effects [20]. Moreover, trait anxiety can shape the thought processes used to judge one's capacity to handle or manage difficult circumstances. Those with high trait anxiety often develop more pessimistic views of their coping resources, seeing obstacles as overwhelming or uncontrollable, which in turn adds to their emotional suffering [20].

Trait anxiety not only burdens a person's immediate psychological state but may also produce lasting effects such as persistent anxiety disorders, depression, or PTSD. These outcomes are especially likely when the individual has experienced direct or indirect losses, illness, or major life disruptions due to the pandemic [21, 22]. Multiple investigations have documented the occurrence of PTSD after infectious disease outbreaks. For instance, Gao and colleagues examined SARS survivors and recorded PTSD rates between 38.8% and 46.2% [23]. Kaputu-Kalala-Malu and colleagues reported a 24.3% prevalence of PTSD among Ebola survivors in Sierra Leone [24]. A comprehensive systematic review and meta-analysis on PTSD following various infectious disease pandemics, including COVID-19, found pooled prevalence rates of 26.2% for males and 27.2% for females [25]. Drawing on data from numerous countries (e.g., Bolivia, China, Italy, Spain, France, and the United States), Cénat and colleagues identified pooled prevalence figures of 21.94% for PTSD and 13.29% for general psychological distress [26]. In another meta-analysis, Yunitri and colleagues determined that the overall PTSD prevalence across 24 countries, such as France, Greece, Norway, and Italy, stood at 17.52% [27].

Several studies have similarly established notable levels of PTSD among university students throughout the COVID-19 pandemic [26, 28]. PTSD represents a multifaceted mental health condition marked by unwanted memories of the traumatic experience or its aftermath, changes in thinking and mood, heightened physiological arousal, and deliberate efforts to avoid trauma-related cues through cognition and behavior [29]. When left untreated, it can seriously impair social relationships, work performance, and academic achievement. Factors linked to the pandemic that heighten fear, anxiety, and risk for PTSD include perceptions of greater personal or family infection risk, having close contacts who became ill, periods of quarantine and social separation, and financial hardship that affects daily survival [25, 30].

The present study draws on the Cognitive Transactional Model (CTM) of stress and coping. This framework emphasizes that cognitive appraisals play a pivotal role in shaping emotional reactions to stressors and determining eventual outcomes [31]. Appraisals involve judging whether a stressful situation matters to one's personal goals and deciding how best to handle the stressor to maximize successful coping. The model highlights ongoing exchanges, or "transactions," between the person and their surroundings [31]. Research has shown that various forms of cognitive appraisals relate differently to emotional and behavioral reactions [32, 33]. For example, Padmanabhanunni and Wiid [33]

demonstrated that strengthening or adaptive appraisals concerning the self, family, and important others were linked to lower PTSD symptoms, including fewer intrusive recollections and avoidance patterns. Li *et al*. [34] found that perceptions of controllability helped predict distress levels and behavioral reactions to the COVID-19 outbreak in China. A study conducted in Turkey [35] found that self-efficacy appraisals were associated with better mental health. At the same time, Prasetyo *et al*. [36] showed that views on the success of COVID-19 control measures and personal vulnerability affected mental health among people in the Philippines. Guided by the CTM, this investigation sought to extend existing knowledge about cognitive appraisals and mental health by testing whether problem-solving appraisal serves as a mediator between fear of COVID-19 and PTSD.

Problem-solving appraisal concerns a person's subjective judgment of their problem-solving capabilities, rather than their objective skills in this area [37]. Most previous research on problem-solving and mental health has focused on actual problem-solving ability [38, 39]. Yet the way individuals evaluate their problem-solving capacity strongly affects the coping strategies they select and the skills they ultimately apply. People who see themselves as poor problem solvers often feel reluctant and unmotivated to tackle difficulties. Hepper *et al*. [40], after reviewing and integrating the literature on problem-solving appraisal and psychological adjustment, concluded that strong links exist between positive problem-solving appraisals and numerous indicators of mental well-being. Later research has continued to support this conclusion [41, 42]. We predicted that problem-solving appraisal would mediate both the link between fear of COVID-19 and the various dimensions of PTSD and the relationship between anxiety and PTSD.

Materials and Methods

Research context

This study was conducted at a historically disadvantaged university in South Africa. Historically disadvantaged institutions (HDIs) were created under the apartheid system specifically for black South Africans and received far fewer resources [30]. Although the post-democracy era has brought considerable progress to the education system, most students attending HDIs still come from working-class families [20]. This pattern stems from historical legacies and the relatively affordable tuition fees at these institutions. A large share of HDI students live in underprivileged communities marked by elevated rates of gang violence, poverty, and substance misuse [20]. These conditions raise their susceptibility to PTSD, and existing research (e.g., [31]) has documented higher rates of trauma-related stress responses among students at such universities.

Participants and procedure

A total of 322 students enrolled at a university in the Western Cape Province, South Africa, participated in the study. Random selection of participants was managed by the university Registrar's office. All measurement tools were incorporated into a single online questionnaire created with Google Forms. Because English is the official language of instruction at the institution, the entire survey was delivered in English. The Registrar's office randomly selected 1500 student email addresses and forwarded the survey link to each of them. This produced a response rate of 21.5%. Response rates of a similar magnitude have been reported in earlier publications [22, 32]. The dataset contained no incomplete responses. The largest proportion of the sample lived in urban settings (87.3%), and 77% identified as female. On average, participants were 26 years old (± 10.2; age range 17–63 years).

Instruments

A battery of established psychological scales was used to assess participants' emotional and cognitive reactions to the pandemic and associated pressures. The specific instruments were the Fear of COVID-19 Scale (FCV-19S: [43]), the Problem-Solving Inventory (PSI: [37]), the PTSD Checklist for DSM-5 (PCL-5: [44]), and the five-item abbreviated trait subscale drawn from the State–Trait Anxiety Inventory (STAI-T5 [45]). Participants also completed a concise set of demographic questions.

The FCV-19S is designed to gauge fear specifically connected to the ongoing pandemic. It comprises seven statements, each answered on a five-point scale from 1 (strongly disagree) to 5 (strongly agree). Summing the responses yields an overall fear score. One representative item reads, "I am most afraid of coronavirus-19." During its initial development, Ahorsu and colleagues [43] obtained an internal consistency of 0.82 and demonstrated validity through links with anxiety, depression, and perceived disease vulnerability. Research conducted in South Africa has confirmed the

strong psychometric performance of the FCV-19S among both students and teachers [16, 46].

The PSI focuses on how individuals view their own problem-solving capabilities rather than on actual competence. The instrument contains 32 statements rated on a six-point scale from 1 (strongly agree) to 6 (strongly disagree). Scoring is arranged so that higher totals indicate a self-perception of poor problem-solving ability. Only the global score was retained for analysis in this investigation. A typical item states, "I make snap judgments and later regret them." In the foundational validation paper, Heppner and Petersen [47] recorded a reliability coefficient of 0.90. Validity evidence stemmed from associations with students' self-evaluations of their problem-solving effectiveness and satisfaction. Multiple South African studies have administered the PSI [48, 49], consistently reporting reliability coefficients of 0.83-0.94.

The PCL-5 evaluates both the occurrence and intensity of posttraumatic stress symptoms. This 20-item tool utilizes a five-point response format ranging from 0 (not at all) to 4 (extremely). All items map onto the DSM-5 diagnostic criteria for PTSD. Four subscales are derived: re-experiencing (intrusive and spontaneous recollections of the traumatic event, 5 items); avoidance (efforts to evade distressing memories, thoughts, feelings, or reminders linked to the event, 2 items); negative alterations in mood and cognition (persistent negative emotions, distorted blame, feelings of detachment, or diminished interest in activities, 7 items); and hyper-arousal (irritability, reckless conduct, sleep problems, heightened alertness, or related difficulties, 6 items). Elevated scores correspond to more pronounced PTSD symptomatology. An example item asks, "In the past month, how much were you bothered by repeated, disturbing, and unwanted memories of the stressful experience?" The scale's creators documented internal consistency values of 0.94 and 0.95 in separate validation samples. Convergent validity was supported by strong associations with other PTSD measures, whereas moderate relations with depression provided evidence of discriminant validity. When tested with South African students, the PCL-5 produced a Cronbach's alpha of 0.93 [33].

The STAI-T5 constitutes a shortened five-item adaptation of the original 20-item trait anxiety portion of the State–Trait Anxiety Inventory [50]. It measures enduring anxiety proneness using five statements, each rated on a four-point scale from 1 (not at all) to 4 (very much so). Greater total scores reflect higher trait anxiety. One sample statement is: "Difficulties are piling up." Zsido *et al*. [45] reported a reliability coefficient of 0.86 for the brief form, nearly identical to the 0.88 value of the complete 20-item version. Validity was indicated by significant associations with depression, life satisfaction, and self-esteem measures. No South African research utilizing the abbreviated STAI-T version could be located.

Ethics

This research was performed in full compliance with the principles of the Declaration of Helsinki. Formal ethical clearance was obtained from the Humanities and Social Sciences Ethics Committee of the University of the Western Cape (ethics reference number: HS22/2/9, February 2022). Involvement remained completely voluntary and anonymous. Informed consent was secured on the opening screen of the web survey. No rewards or incentives of any kind were provided to participants.

Data analysis

The online questionnaire was designed so that every question required a response before participants could move forward. Consequently, the collected data contained no missing entries. All statistical computations were carried out using IBM SPSS Statistics version 26 for Windows (IBM Corp., Armonk, NY, USA). These computations included checks for skewness and kurtosis, calculation of basic descriptive statistics (means and standard deviations), Pearson product-moment correlations among variables, and reliability analyses using Cronbach's alpha. For the purpose of evaluating normality, skewness statistics ranging from −2 to +2 and excess kurtosis statistics ranging from −7 to +7 were accepted as evidence of roughly normal score distributions [51]. The PROCESS macro within SPSS [42] served to test whether problem-solving appraisal acted as a mediator between fear of COVID-19 and PTSD symptoms (PROCESS Model 4).

Additionally, a moderated mediation model was tested to determine if anxiety influenced the strength of this mediated pathway (PROCESS Model 7). Before creating the interaction term, fear of COVID-19 scores and anxiety scores were mean-centered. The form of the moderation was visualized at three points on the anxiety variable: one standard deviation below the mean, at the mean, and one standard deviation above the mean. These visual plots were produced using the graphing code automatically supplied by the PROCESS macro. The

index of moderated mediation generated by PROCESS was inspected to establish under which conditions the indirect pathway from fear of COVID-19 to PTSD varied according to anxiety level. Whenever this index was statistically significant, PROCESS reported the specific conditional indirect effects for each of the three anxiety levels.

Results and Discussion

Summary statistics, bivariate correlations, and reliability coefficients for all study variables appear in **Table 1**. Examination of skewness and kurtosis values confirmed that scores on every instrument approximated a normal distribution, as all indices remained inside the acceptable boundaries. Each scale exhibited adequate internal consistency, with Cronbach's alphas ranging from 0.82 to 0.89.

Table 1. Descriptive statistics for, reliabilities of, and intercorrelations between study variables.

Constructs and measures	7	6	5	4	3	2	1
1. COVID-19 fear							—
2. Problem-solving evaluation						—	0.12 *
3. Intrusive recollection					—	0.35 **	0.28 **
4. Avoidant behavior				—	0.66 **	0.28 **	0.26 **
5. Negative cognitive/mood changes			—	−0.59 **	0.12 **	0.51 **	0.26 **
6. Hyperarousal symptoms		—	0.80 **	−0.54 **	0.67 **	0.43 **	0.26 **
7. Anxiety levels	—	0.59 **	0.65 **	0.48 **	−0.54 **	0.48 **	0.20 **
Average (mean)	12.4	11.2	13.5	4.3	9.5	97.8	17.4
Standard deviation (SD)	4.1	6.0	7.5	2.6	5.5	20.3	6.5
Skewness coefficient	0.03	0.02	0.02	−0.21	0.04	−0.08	0.35
Kurtosis value	−0.88	−0.91	−1.04	−1.18	−0.95	−0.05	−0.44
Cronbach's alpha	0.88	0.82	0.88	0.89	0.89	0.89	0.87

$P < 0.001$, $P < 0.05$.

Table 1 further revealed that fear of COVID-19 showed small but positive links with problem-solving appraisal ($r = 0.12$, $P = 0.04$) and moderate positive links with every PTSD symptom cluster (re-experiencing: $r = 0.28$, $P < 0.001$; avoidance: $r = 0.26$, $P < 0.001$; negative alterations in mood and cognition: $r = 0.26$, $P < 0.001$; hyper-arousal: $r = 0.26$, $P < 0.001$) as well as with anxiety ($r = 0.20$, $P < 0.001$). In practical terms, greater fear of the virus was tied to viewing oneself as a less capable problem solver, experiencing more intense PTSD symptoms across all domains, and reporting higher anxiety. Problem-solving appraisal itself correlated positively with all PTSD dimensions (re-experiencing: $r = 0.35$, $P < 0.001$; avoidance: $r = 0.28$, $P < 0.001$; negative alterations in mood and cognition: $r = 0.51$, $P < 0.001$; hyper-arousal: $r = 0.43$, $P < 0.001$) and with anxiety ($r = 0.48$, $P < 0.001$). These patterns indicate that self-perceptions of weak problem-solving ability accompany elevated posttraumatic stress and anxiety symptoms.

When the PTSD subscale means were interpreted against the original 5-point response scale of the PCL-5, the averages were 1.9 for re-experiencing, 2.15 for avoidance, 1.93 for negative alterations in mood and cognition, and 1.87 for hyper-arousal. Applying a provisional PTSD cut-off score of 31 (recommended by Ashbaugh and colleagues), 62.1% of participants qualified for a likely PTSD diagnosis [52].

Direct influences of fear of COVID-19 and problem-solving appraisal on the separate PTSD symptom clusters are shown in **Table 2**. Every direct effect reached statistical significance, aligning closely with the earlier simple correlations.

Table 2. Direct effects of fear of COVID-19 and problem-solving appraisal on PTSD.

Predictor–outcome relationship	β coefficient	Standard error (SE)	P-value	95% confidence interval (lower)	95% confidence interval (upper)
COVID-19 fear → Re-experiencing	0.20	0.04	0.000	0.12	0.29
COVID-19 fear → Avoidance	0.09	0.02	0.000	0.05	0.13
COVID-19 fear → Negative Changes	0.23	0.05	0.000	0.13	0.34
COVID-19 fear → Hyperarousal	0.19	0.05	0.000	0.11	0.28

Problem-solving evaluation → Re-experiencing	0.09	0.01	0.000	0.06	0.11
Problem-solving evaluation → Avoidance	0.03	0.01	0.000	0.02	0.05
Problem-solving evaluation → Negative changes	0.18	0.02	0.000	0.15	0.21
Problem-solving evaluation → Hyperarousal	0.12	0.01	0.000	0.09	0.15

Results from the mediation tests indicated that problem-solving appraisal functioned as a significant mediator in the pathways from fear of COVID-19 to each PTSD symptom cluster: re-experiencing (β = 0.03, 95% CI [0.002, 0.065]), avoidance (β = 0.01, 95% CI [0.000, 0.026]), negative alterations in mood and cognition (β = 0.06, 95% CI [0.002, 0.111]), and hyper-arousal (β = 0.04, 95% CI [0.001, 0.087]).

The moderated mediation analysis uncovered a statistically significant interaction term (fear of COVID-19 × anxiety: β = −0.08, P = 0.02). This result demonstrated that anxiety altered the strength of the association between fear of COVID-19 and problem-solving appraisal. The specific pattern of this moderation appears in **Figure 1**.

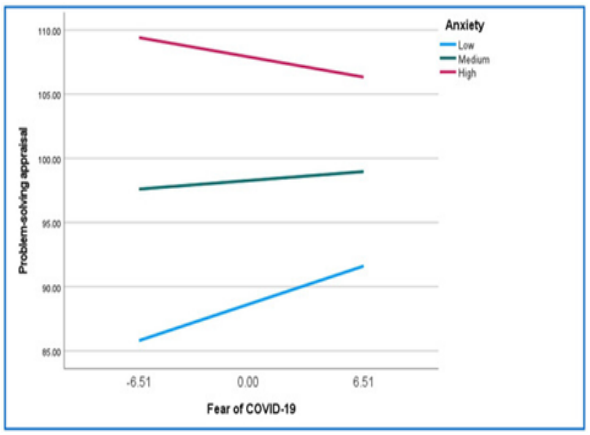

Figure 1. The relationship between fear of COVID-19 and problem-solving appraisal for high, medium, and low levels of anxiety.

Among participants who reported elevated anxiety, the direction of the regression slope was reversed relative to the slopes found for individuals with low or average anxiety. This reversal implies that, for those with high anxiety, rising fear of COVID-19 corresponded to improved self-perceptions of problem-solving competence (that is, stronger beliefs in one's ability to solve problems effectively). Follow-up simple slope analyses showed a clear positive link between fear of COVID-19 and problem-solving appraisal at low anxiety (β = 0.46, P = 0.04). However, this link did not reach significance at medium anxiety (β = 0.10, P = 0.50) or at high anxiety (β = −0.24, P = 0.24).

The complete moderated mediation pathway is depicted in **Figure 2**.

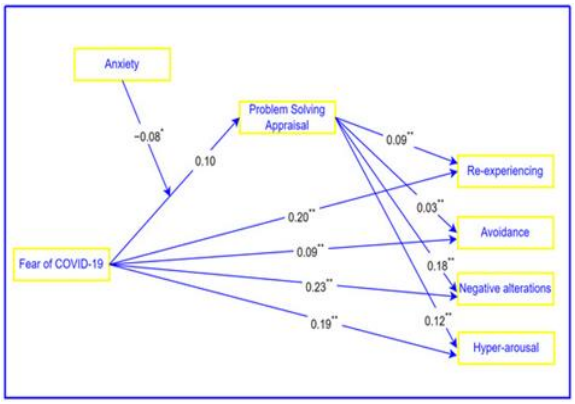

Figure 2. Mediating role of problem-solving appraisal in the relationship between fear of COVID-19 and PTSD, and the moderating role of anxiety (P < 0.001, P < 0.05).

The indices of moderated mediation for each PTSD symptom dimension are summarised in **Table 3**. All indices proved statistically significant, confirming that anxiety conditioned the strength of the indirect effects from fear of COVID-19 to the PTSD dimensions.

Table 3. Indices of moderated mediation (anxiety).

Dependent outcome	Bootstrapped SE	Effect index	95% bootstrapped CI (upper)	95% bootstrapped CI (lower)
Re-experiencing symptoms	0.003	−0.007	−0.002	−0.013
Avoidance responses	0.001	−0.003	−0.001	−0.005
Negative cognitive changes	0.006	−0.015	−0.003	−0.026
Hyperarousal reactions	0.004	−0.010	−0.002	−0.018

Conditional indirect effects of fear of COVID-19 on the various PTSD dimensions at differing anxiety levels

appear in **Table 4**. Across all PTSD symptom clusters, the indirect effects were statistically significant solely for participants with low anxiety; they were non-significant for participants with medium or high anxiety. This pattern verifies that anxiety moderated the mediating function of problem-solving appraisal. While the standard mediation analysis had identified a reliable mediating role for problem-solving appraisal across every PTSD dimension, the moderated mediation analysis revealed that this mediation remained significant only among those reporting low anxiety levels.

Table 4. Conditional indirect effects of fear of COVID-19 on PTSD at different levels of anxiety.

Anxiety level	Outcome domain	Standard error (SE)	Effect estimate	95% Confidence interval (upper)	95% Confidence interval (lower)
Re-experiencing	Low anxiety	0.02	0.038	0.082	0.001
	Medium anxiety	0.01	0.009	0.040	−0.012
	High anxiety	0.02	−0.020	0.014	−0.053
Avoidance	Low anxiety	0.008	0.014	0.032	0.000
	Medium anxiety	0.006	0.003	0.015	−0.007
	High anxiety	0.007	−0.008	0.005	−0.021
Negative cognitive changes	Low anxiety	0.041	0.080	0.159	0.003
	Medium anxiety	0.029	0.019	0.077	−0.037
	High anxiety	0.035	−0.042	0.029	−0.111
Hyperarousal symptoms	Low anxiety	0.028	0.054	0.112	−0.001
	Medium anxiety	0.020	0.013	0.054	−0.025
	High anxiety	0.023	−0.028	0.019	−0.075

The COVID-19 pandemic has been linked to various negative mental health consequences [3, 53]. Fear has emerged as one of the primary emotional reactions to the spread of the disease, and higher levels of fear have consistently been tied to poorer mental health, such as increased anxiety, depression, and PTSD symptoms [17, 54]. Previous studies have emphasized the key role of cognitive appraisals in emotion regulation and psychological adjustment. Most of this work has concentrated on the harmful impact of negative appraisals, while paying relatively little attention to the beneficial effects of positive or adaptive appraisals [55, 56]. Such adaptive appraisals can act as a buffer and help reduce the likelihood of developing serious mental health difficulties. The present study sought to build on this body of research by investigating the possible mediating function of problem-solving appraisal in the connection between fear of COVID-19 and PTSD symptoms. Several noteworthy results emerged.

First, the findings showed that fear of COVID-19 was positively related to every dimension of PTSD. It is widely recognized that fear represents a core emotional response to traumatic experiences, and established theoretical frameworks of PTSD suggest that difficulties in memory processing of the event, along with fear acquired through classical conditioning, contribute to the ongoing maintenance of the condition [57-59]. During the COVID-19 pandemic, fear may stem from uncertainty about the outbreak's progression, the virus's rapid spread, elevated death rates, and concerns about potential health effects on oneself and loved ones. People who contracted the virus or believed they might have been infected have been shown to report more intense fear and PTSD symptoms [60]. In addition, those with a previous history of trauma appear especially susceptible to developing fear and PTSD when faced with new, potentially traumatic circumstances [23]. The current sample consisted of students attending a historically disadvantaged institution in South Africa, where earlier investigations have documented elevated trauma exposure due to living conditions marked by community violence, joblessness, poverty, and substance misuse [61]. Moreover, restricted availability of personal protective equipment and healthcare services in these environments may have intensified fears related to COVID-19 and heightened vulnerability to PTSD. It is therefore plausible that earlier traumatic experiences increased these students' susceptibility to fear and PTSD during the pandemic.

Second, the results indicated that more positive self-appraisals of problem-solving ability were connected to reduced fear of COVID-19 and lower PTSD symptoms. This outcome highlights the protective value of constructive cognitive appraisals in supporting emotional

regulation and adaptive coping. People who see themselves as poor problem solvers tend to rely on unhelpful emotion regulation strategies, including rumination (passively dwelling on problems and their causes), thought suppression, and behavioral avoidance [62]. These approaches have been shown to sustain fear and PTSD symptoms by blocking the proper processing of traumatic experiences [57]. By comparison, strategies such as positively reinterpreting difficult situations have been associated with better coping and improved overall well-being [63].

Third, anxiety was found to moderate the link between fear of COVID-19 and problem-solving appraisal. Specifically, among individuals with high anxiety, greater fear of COVID-19 was related to more positive perceptions of problem-solving skills (i.e., stronger beliefs in one's effectiveness as a problem solver). When anxiety was not considered, problem-solving appraisal served as a mediator between fear of COVID-19 and all PTSD symptom dimensions. However, once anxiety was included as a moderator, the indirect effects of fear of COVID-19 on PTSD remained significant only for participants with low anxiety. Cognitive theories of emotion regulation suggest that intense negative emotions can disrupt higher-order mental processes such as appraisal, planning, and cognitive flexibility [57, 58]. Applied to the present results, it seems likely that elevated anxiety interfered with participants' ability to form positive self-appraisals regarding their problem-solving capabilities.

The observation that anxiety moderated the association between fear of COVID-19 and problem-solving appraisal is also consistent with personality frameworks proposing that people high in trait anxiety are prone to experiencing reduced confidence in their problem-solving skills when confronted with stress [64]. This is especially pertinent during the COVID-19 pandemic, which brought sudden and far-reaching disruptions to the education system and created numerous new challenges for students. Those with high trait anxiety may have viewed these disruptions as particularly overwhelming, which in turn affected their cognitive appraisals and limited their capacity for effective problem solving. These findings emphasize the value of incorporating personality-based perspectives when exploring how students manage pandemic-related stress. They also highlight the importance of designing interventions that account for individual personality differences to strengthen resilience and improve coping strategies when facing current and future stressors [64].

The results of this investigation carry several practical implications for designing interventions that foster adaptive coping strategies among university students. Previous research has shown that problem-solving skills can be strengthened through targeted training and repeated practice, indicating that this protective element is suitable for inclusion in intervention programs [65, 66]. Established psychological treatments, particularly cognitive-behavioral methods, place strong emphasis on improving emotion regulation techniques and encouraging effective coping by encouraging positive reinterpretations of challenging situations [66]. Drawing from the present findings, a key element of such interventions should involve detecting and directly addressing unhelpful self-appraisals concerning one's problem-solving capabilities. Doing so may foster more positive emotional states, boost self-confidence, and expand the repertoire of available coping options. Growing empirical support has emerged in recent years for problem-solving training programs, many of which center on improving individuals' appraisals of their own problem-solving effectiveness [67]. The discovery that anxiety moderated the link between fear of COVID-19 and problem-solving appraisal further suggests that routine screening for anxiety levels should form an integral part of any intervention strategy.

Interpretation of the present findings must take into account several important limitations. First, the sample consisted largely of students from a single institution and was relatively homogeneous; future work would benefit from recruiting more diverse participant groups. Second, the cross-sectional design limits the ability to draw firm causal conclusions. Longitudinal research that tracks students over extended periods is required to clarify the dynamic relationships between protective factors and mental health outcomes. Third, data were gathered via an online self-report questionnaire, which may have led to students with greater access to digital devices or stronger interest in the subject matter being over-represented. This could have introduced both selection bias and social desirability bias. Finally, the study did not measure prior trauma exposure or other adverse life events. Although the PCL-5 has been used in comparable research with university students [55], caution is advised when interpreting scores as direct indicators of PTSD. It is also possible that sources of anxiety and traumatic stress unrelated to the COVID-19 pandemic contributed to the

observed symptoms. Subsequent studies should therefore examine additional unmeasured variables, particularly the history of trauma exposure.

Conclusion

This study adds to the existing literature by highlighting the value of adaptive cognitive appraisals in supporting coping among university students amid the COVID-19 pandemic. Including a specific measure of problem-solving appraisal within the pandemic context constitutes a meaningful addition to the field. The expected mediating role of problem-solving appraisal in the relationship between fear of COVID-19 and the various dimensions of PTSD received empirical support. Nevertheless, this mediation was qualified by anxiety. In particular, the indirect effects of fear of COVID-19 on PTSD symptoms were significant only among participants reporting low levels of anxiety. Interventions focused on reducing anxiety may therefore play a valuable role in safeguarding student mental health.

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Conflict of Interest: None

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Ethics Statement: The current study was conducted in accordance with the Declaration of Helsinki. Ethical approval for the study was provided by the Humanities and Social Sciences Ethics Committee of the University of the Western Cape (ethics reference number: HS22/2/9, February 2022).
Informed consent was obtained from all participants involved in the study.

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